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Uterine Contents

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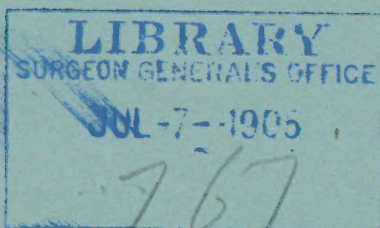
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MAJ. J. V.

FORTY CASES OF FEVER IN THE PUERPERIUM, WITH
BACTERIOLOGICAL EXAMINATION OF THE
UTERINE CONTENTS.¹

FOR the past two years it has been my routine custom to examine the uterine lochia bacteriologically in every case of fever during the puerperal period, whether occurring in the Obstetrical Department of the Johns Hopkins Hospital or in my private or consultation practice.

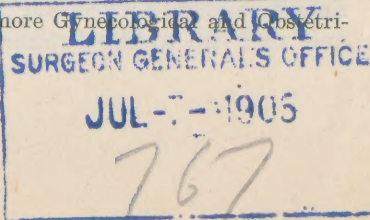
I wish to consider this evening the results of the examination of 40 such cases which have come under my observation within the past two years.

This work has possessed a double interest for me. For it is not only of importance from a theoretical and scientific point of view, in confirming in great part the observations of the many investigators who have busied themselves with the consideration of the etiology of puerperal infection, but it has also led to the discovery of the part which may be played by several organisms which up to this time have not been observed in connection with puerperal infection.

In addition to its purely scientific aspects, the work is of equal, if not greater, importance in its practical applications; for it enables us to make a positive diagnosis as to the presence or absence of puerperal infection and of the species of organism or organisms which stand in a causal relation to it, and in many instances determines the prognosis and treatment of the case.

In our work we have adopted the usual arbitrary standard of considering as abnormal every case in which the temperature exceeds 100.4° F. (38° C.) at any time during the puerperium. As single rises of temperature slightly above this point occur

¹ Abstract of remarks before the Baltimore Gynecological and Obstetrical Society, March 8, 1898.



in a considerable number of cases, we have adopted the rule of taking cultures from the uterus only in those cases in which the temperature rises to 101° F. (38.3° C.) or higher. Whenever the temperature reaches that point in a case in the obstetrical wards of the Johns Hopkins Hospital, no matter what may be supposed to be its cause, the head nurse at once notifies the resident obstetrician, and cultures are promptly made from the uterine cavity, by myself if possible, or by the resident in my absence. In the out-patient department and in my own practice the limit is placed at 102° F. (39° C.) on account of the technical difficulties which surround taking cultures outside of the hospital. With a few exceptions, in which there was a single rise of temperature, which fell before cultures could be made, the 40 cases under consideration represent every case coming under my observation during the past two years in which the above-mentioned temperature has been reached.

Before taking up the consideration of our cases in detail I think it will be well to describe the method by which we obtain the uterine lochia for examination. For this purpose we use the method which was first introduced by Döderlein: A glass tube, 25 centimetres long and 3 to 4 millimetres in diameter, is curved at one end like a uterine sound. It is then placed in a long, thick glass test tube, especially made for the purpose, whose open end is plugged with cotton, and sterilized by dry heat at 150° C. for one hour. The large test tube is simply intended to enable us to carry the smaller tube around with us in a sterile condition.

When a culture is to be taken the external genitals of the patient are carefully washed with soap and hot water, and later with a 1 : 1000 bichloride solution, while the hands of the operator are carefully disinfected by soap, nail brush and hot water, permanganate of potash, oxalic acid, and bichloride. The patient is then placed in Sims' position, the thighs and buttocks being covered with sterilized towels, and a Sims speculum introduced. The anterior lip of the cervix is seized with bullet forceps and the cervix brought down as far as possible. The exterior of the cervix and external os are then carefully wiped off with sterile absorbent cotton, when everything is ready for the introduction of the tube, which is then taken from its containing tube, grasped at its straight end by two fingers, and its curved end carefully introduced into the cervix and then up to the fundus of the uterus, care being taken to

avoid contact with anything until the os externum is passed. A large syringe is then attached to the free end of the tube, suction made, and a greater or less quantity of uterine lochia is aspirated into the tube. The syringe is then taken off, the tube removed from the uterus and both its ends sealed with sealing wax. It is now replaced in the containing tube and taken to the laboratory for examination, where it is nicked with a file and broken at that point when cultures and cover glasses are made from its contents. As the tube is hermetically sealed, it is not necessary to make the culture at once, but it may be laid aside for several hours until perfectly convenient.

The 40 cases which we have under consideration were from the following sources: 22 women delivered in the obstetrical wards of the Johns Hopkins Hospital, 8 women delivered in the out-patient department of the hospital, and 10 cases seen in consultation. I have included among the consultation cases several which were delivered outside the hospital by persons not connected with it, and sent to the hospital after symptoms of infection had appeared.

It therefore appears that 30 of the cases occurred among the 600 women who have thus far been delivered by the in- and out-patient departments of the hospital, while the remaining 10 were delivered by persons not connected with it.

In every case cover slips were made and the uterine lochia were plated upon ordinary agar, acid agar, and glucose-agar, and blood serum or blood serum and agar slants were inoculated, and anaerobic cultures made upon glucose-agar by inoculating a melted tube, allowing it to solidify, and then pouring the contents of a second tube upon it. With a few exceptions, the blood was examined in every case for malarial plasmodia.

By these methods we found streptococci in 8 cases; staphylococci in 3 cases; colon bacilli in 6 cases; gonococci in 2 cases; anaerobic bacteria in 4 cases; unidentified aerobic bacteria in 3 cases; bacteria in cover glass, but cultures sterile, in 4 cases; diphtheria bacilli in 1 case; gas bacilli (*bacillus aerogenes capsulatus*) in 1 case; typhoid bacilli in 1 case; cover glass, cultures, and blood sterile in 11 cases; cover glass and cultures sterile, with malarial plasmodia in blood, in 1 case—making a total of 44 cases.

This apparent discrepancy is due to the fact that we had to deal with a mixed infection in several instances: thus, we had one case with streptococci and colon bacilli, a second with

staphylococci and colon bacilli, and a third with typhoid bacilli, streptococci, staphylococci, and an unidentified anaerobic gas-producing bacillus.

When we consider our work more in detail we find that it confirms the results obtained by most observers, and also adds several organisms to the already long list of bacteria which may lead to puerperal infection.

This will be rendered more apparent if we consider briefly and separately each group of cases. Streptococci were first cultivated from a case of puerperal infection by Pasteur in 1880, and since then have been demonstrated by an almost countless number of observers. Indeed, they are found so frequently, especially in fatal cases, that until very recently many authors considered them to be the sole organism concerned in the production of the affection. Recent work has, however, demonstrated that such is not the case, which, as already indicated above, is amply borne out by our own observations; but they are, nevertheless, the most important etiological factor in the production of puerperal infection, especially in its fatal forms. In the 40 cases, we demonstrated streptococci more frequently than any other organism, and found them in 8 cases (20 per cent), none of which, however, ended fatally. It is interesting to note that streptococcic infection has not yet occurred in any of our house cases, but was present in 3 out of the 8 out-door fever cases and in 5 out of the 10 consultation cases. In 6 cases the streptococci were demonstrated in pure culture, while in the other 2 cases we had to deal with a mixed infection. In one case they were associated with colon bacilli, and in the other with typhoid bacilli, the staphylococcus aureus, and an anaerobic gas-producing bacillus.

It was not until 1888 that Brieger demonstrated that staphylococci might cause puerperal infection, and his results were soon confirmed by Döderlein, Hägler, and others. It was generally believed that this variety of infection occurred but rarely, and, when it did, usually gave rise to mild forms of disease. Strücnkmann, however, in a very recent article, combats this view, and, from his own experience and a very exhaustive review of the literature, concludes that staphylococcic infection occurs more frequently than is usually supposed and frequently results in serious and sometimes in fatal illness. We have demonstrated staphylococci in 3 cases: once alone, and twice associated with other organisms. In one case we found the staphylococcus epidermidis albus alone and are inclined to consider it a con-

tamination ; in the second case we found the albus and colon together, while in the third case we found the aureus in combination with the streptococcus and typhoid bacillus. None of these cases died, and it is apparent that it is difficult to state what part, if any, the staphylococci played in the production of the symptoms observed.

The colon bacillus was not mentioned as a cause of puerperal infection until 1893, when Von Franqué demonstrated its presence in pure culture in one of his cases. The same year, in an article entitled "Puerperal Infection considered from a Bacteriological Point of View," I referred to Von Franqué's case and stated that it was remarkable that colon infections had not been observed more frequently, and predicted, attention having been directed to them, that they would probably soon be demonstrated in a considerable number of cases. This prediction has been amply fulfilled and a very large number of such cases reported—so many, indeed, that their mere enumeration would no doubt prove wearisome to you, and I shall therefore only mention the cases which have been reported by Gebhard, Krönig, and Marmorek. We have demonstrated colon bacilli in 6 of our cases: in pure culture in 4 cases, and combined with the streptococcus in one and with the staphylococcus albus in another case. Two of the pure colon cases were observed in the in-door hospital work, and the other 2 in consultation; while the mixed infection with the staphylococcus was observed in the out-patient department, and the one with the streptococcus was seen in consultation.

It is of interest to note that both of the hospital cases occurred in patients with eclampsia, in whom it was necessary to dilate the cervix manually and extract the child. In both these cases croton oil had been given before the operation, causing profuse watery stools during its performance, by which the hands were unavoidably soiled and therefore readily afforded a satisfactory explanation for the infection. In the streptococcus and colon case there was a complete tear into the rectum, through which colon bacilli gained access to the generative tract. The mode of infection in the other 3 cases was not so evident, but, when we consider the marked proximity of the rectum to the vagina, the cause is probably not far to seek.

Krönig in 1893 was the first to cultivate the gonococcus from cases of puerperal infection, and since then has abundantly confirmed his original observations, and in his recent work was able to refer to 50 such cases which he had observed him-

self. In 2 of our cases we were likewise able to demonstrate gonococci as the cause of the fever.

Thus far our work is perfectly in accord with that of the great majority of observers, and only serves to substantiate the doctrine that puerperal infection is wound infection, and like it may be due to a number of different bacteria which have been introduced into the patient from without.

We shall now turn to the consideration of 11 cases in which the relation between the clinical symptoms and the bacteria observed in the uterus is not so clear. In some of them we doubtless had to deal with sapremia in the sense of Matthews Duncan, while in several others it is doubtful whether the bacteria observed played any part in the production of the symptoms.

This aspect of puerperal infection has been studied by Bumm, Von Franqué, and especially by Krönig, who have demonstrated in a certain number of fever cases that the uterus did not contain the usual pathogenic organisms with which we are all so well acquainted, but various cocci and bacilli, which for the greater part could not be cultivated at all, or only anaerobically, and which could not be identified with well-known organisms.

In 4 of our cases we were able to cultivate strictly anaerobic organisms from the uterine lochia. In 2 of these cases we had to deal with short, thick bacilli, and in a third with a thick bacillus which was from three to five times as long as broad. None of these organisms appeared to possess a great degree of virulence, as the highest temperature in these cases was 101.6° F. (38.8° C.). The fourth case, on the contrary, ended fatally, and in it we were able to demonstrate the gas bacillus (*bacillus aerogenes capsulatus*) and the streptococcus, which has already been reported by Dr. George W. Dobbin in the *Johns Hopkins Hospital Bulletin*.

In 3 other cases we were able to cultivate aerobic bacteria which we were unable to identify. From 2 of these we cultivated a non-pathogenic streptobacillus, which grew upon all media and stained by Gram's method.

Before labor we cultivated from the vaginal secretion of one of these cases an organism which was apparently identical with the one found during the puerperium, and it is a question whether it was a case of autoinfection or not. However that may be—and we are unwilling at present to express a definite opinion concerning it—it is the only case among the 40 which

offers the slightest evidence in support of the doctrine of auto-infection. From the third of these cases, a woman who had aborted at the fourth month and who was not examined internally, and in whom the temperature rose to 103.5° F. (39.8° C.) on the eighth day, which, however, fell promptly after brisk purgation, we cultivated a non-pathogenic bacillus which had all the characteristics of the colon bacillus, except that it did not decolorize with Gram's stain and did not produce gas in glucose-agar.

In 4 other cases of this group we were able to demonstrate the presence of bacteria in the uterine lochia in cover-slip preparations, but were unable to cultivate them either aerobically or anaerobically. In 3 of these cases we found cocci and short, thick bacilli, while in the fourth case we had to deal with a large, thick bacillus. In this case the temperature rose suddenly to 104.4° F. (40.3° C.) on the fourth day, and fell within twenty-four hours after a brisk purgation, never to rise again.

It is apparent, leaving out of consideration the case of gas-bacillus infection, that we must be cautious in attributing the clinical symptoms observed in this group of cases to the bacteria which were demonstrated in the uterus; for it is more than likely, in several cases at least, that no causal relation existed between them and the symptoms observed, but that the symptoms were probably due to intestinal autointoxication and that the bacterial find was purely accidental.

On the other hand, it is probable that the bacteria which were demonstrated in several cases of this group did give rise to the symptoms. But whether they were due to the direct invasion of the tissues by the bacteria, or to the absorption of poisonous substances, produced by bacteria, which were present in the necrotic material lining the interior of the uterus, are questions which we must leave unanswered until further study of this class of cases affords us data upon which we can base definite assertions.

The practical value of the bacteriological examination of the uterine lochia is clearly demonstrated by the study of this group of 11 cases, for by no other means could we so promptly arrive at a definite diagnosis and thereby exclude infection by the more dangerous pyogenic bacteria. Its practical value, however, is even still more strikingly illustrated by the group of cases which we shall now consider.

In 11 other cases, in which there was a more or less marked rise of temperature, the bacteriological examination was abso-

lutely negative. In none of these cases were we able to demonstrate the presence of bacteria upon cover-glass preparations or by cultural methods, and in every case the examination of the blood was negative. We were therefore able in each case to exclude positively the presence of puerperal infection on the one hand and malaria on the other.

How great a gain this is can only be appreciated by those who have experienced the immense relief of finding that the uterus is absolutely sterile in a patient whose temperature has suddenly shot up to 103° or 104° on the third or fourth day of the puerperium, and in whom we suspect the possibility of an infection. This has happened to us upon a number of occasions, and the relief afforded by the negative result of the examination has more than repaid us for the labor expended upon the entire series of cases under consideration.

Further observation of this group of cases has shown that in many instances the temperature was probably due to an auto-intoxication from the intestines, as was indicated by the rapid fall of temperature after brisk purgation. In other cases the rise of temperature was undoubtedly due to disturbances about the breasts, while in a few cases we were absolutely unable to find any cause for the temperature.

In a case of quartan malarial infection occurring during the puerperium, the examination of the lochia enabled us to exclude positively the possibility of its being associated with a puerperal infection. And we do not consider that in future one will be justified in treating as malarial a rise of temperature occurring during the puerperium, unless the examination of the blood reveals the presence of the characteristic plasmodia and the examination of the uterine lochia demonstrates the absence of bacteria.

In addition to the results already referred to, our work has led to the discovery of puerperal infection by several organisms which have not been previously described in this connection, or which, if described, occur but rarely. Thus, in one case we found the gas bacillus (*bacillus aerogenes capsulatus*), which has already been described by Dr. George W. Dobbin in the *Johns Hopkins Hospital Bulletin* and *Die Monatschrift für Geburtshülfe und Gynäkologie*; in a second case the diphtheria bacillus, described by me in *THE AMERICAN JOURNAL OF OBSTETRICS*¹; and in a third case the typhoid bacillus, which will be published by me in the *Centralblatt für Gynä-*

¹See the August number, p. 180.

kologie, and which has already been described by Dr. Dobbin in this JOURNAL.²

I have attempted this evening to give an idea of the work which we are doing, without going into details, as we expect to publish our results more fully at a later period, when we shall base them upon a larger number of cases, giving more detailed information about the bacteria observed, and accompanying it with illustrative charts and histories of cases. But we hope that what we have said will be sufficient to convince you of the importance and practicability of this character of work, and of the value as a means of diagnosis and as a guide for treatment.

In conclusion I might add that this work was done either by myself, or under my supervision by Dr. George W. Dobbin, resident obstetrician, Johns Hopkins Hospital.

¹ See the August number, p. 185.

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